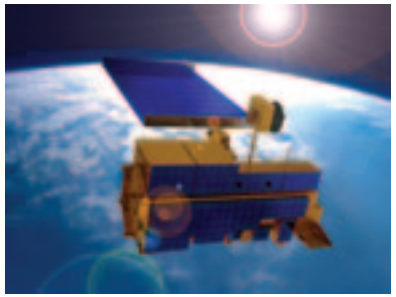
Supercomputing at NASA

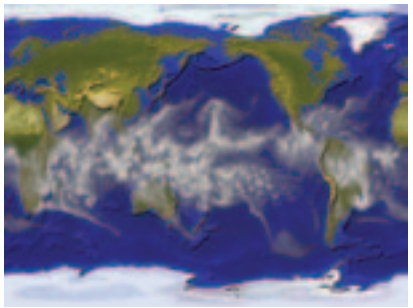
Supercomputers recreate the universe mathematically at billions of calculations per second. These machines are enabling NASA to:

Assimilate vast quantities of observation data into models.



Terra satellite
NASA

Simulate Earth and space phenomena that cannot be observed directly.



Simulation of precipitable water
NCAR

Understand how the Earth system responds to natural and human-induced changes.

Identify consequences of change for regional assessments and policy decisions.

Produce predictions of weather, climate, natural hazards, and other systems.

For More Information

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http://ct.gsfc.nasa.gov

Partnering with the Earth Science Technology Office

National Aeronautics and Space Administration
Goddard Space Flight Center

Computational Technologies Project

Exploring Earth and space with supercomputers

The NASA Mission

To understand and protect our home planet

To explore the universe and search for life

To inspire the next generation of explorers

... as only NASA can

Cloud cover simulation
NASA/GSFC

NP-2002-4-454-GSFC

What CT Does

Serving NASA's Earth Science Enterprise, the Computational Technologies (CT) Project builds collaborations to develop software frameworks that enable more realistic simulations of natural phenomena and interpretation of vast quantities of observational data on supercomputers.

Global methane data assimilation NASA/GSFC

CT Activities

Selects world-class investigation teams to develop supercomputing applications software technology in the Earth and space sciences.

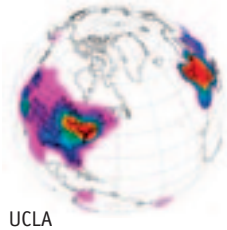
Supports NASA-based computational scientists who develop software to simplify parallel programming and visualize data.

Designs software to be usable by the wider research community.

Provides software free of charge on the World Wide Web.

Arranges supercomputer access for the teams to apply their software to solving major science problems.

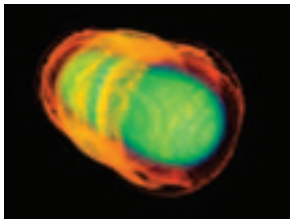
CT Scientific Firsts



Atmospheric models yield comprehensive picture of chlorofluorocarbons in atmosphere.

UCLA

Neutron stars merge to form black hole in general relativity simulation.

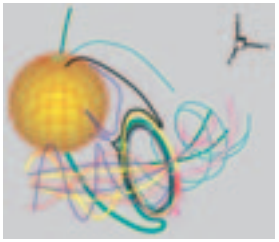


Washington Univ.

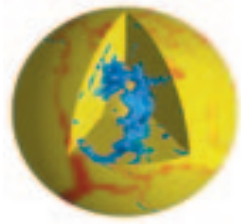
Amazon rainforest mosaic correlates flooding and deforestation.

NASA/JPL

Simulation demonstrates plausible mechanism for coronal mass ejection to escape Sun.



NRL-NASA/GSFC



Combining seismic data with simulations locates remnants of tectonic plate that formed Rocky Mountains.

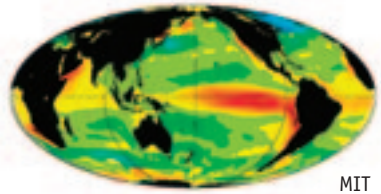
Princeton Univ.

Software Frameworks

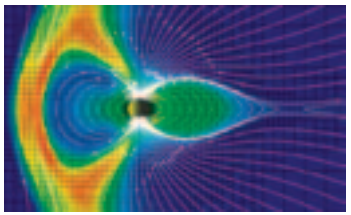
A framework is a software infrastructure that allows multiple organizations to share and reuse each other's software.

CT Frameworks Underway

- Earth system modeling (climate and weather)
- Earthquake forecasting
- Invasive plant species prediction



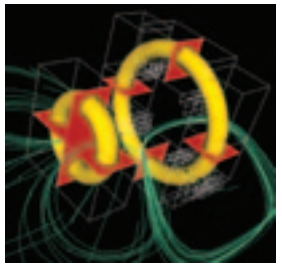
MIT



- Space weather modeling
- Gamma-ray burst and radiation flow modeling

Univ. of Michigan

- Star formation and microgravity environments simulation
- National Virtual Observatory mosaicking service



LBNL

Benefits of Frameworks

- Reduce redundant effort
- Strengthen communication and collaboration among diverse groups
- Simplify exchange and incorporation of new sub-models
- Accelerate improvements in U.S. predictive capabilities